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EXAMINER	
ALEJANDRO MULERO, LUZ L	
ART UNIT	**PAPER NUMBER**
1763	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/470,236	BAILEY ET AL.	
	Examiner	Art Unit	
	Luz L. Alejandro	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,16,17,19,23-25,28-33,35,36,42-45,48,50,54 and 57-75* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10, 16-17, 19, 23-25, 28-33, 35-36, 42-45, 48, 50, 54, 57-75* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 63 and 69 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In the specification, as originally filed, there is no support for the limitation "the gas distribution plate and the gas ring cooperating to release the identical input gas in an azimuthally symmetric manner inside the plasma process chamber" as disclosed in claim 63, lines 4-5. There is nothing in the specification to indicate that the gases will have exactly or identical compositions. Furthermore, the specification, as originally filed, fails to find support for the limitation "a single source of input gas" as recited in claim 69-line 8. It appears from fig. 2 that more than one gas source is contemplated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3, 7-10, 16-17, 70-71, and 75 are rejected over 35 USC 103(a) as being unpatentable over Li et al., U.S. Patent 6,009,830 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810.

Li et al. shows substantially the invention as claimed including a plasma processing system, said plasma processing system comprising: a substantially cylindrical plasma processing chamber 8 used to process a substrate 10, said substantially cylindrical plasma processing chamber including a top region 38 located on the top surface of said substantially cylindrical plasma processing chamber, an upper peripheral region (40) located on a surface surrounding the periphery of said substantially cylindrical plasma processing chamber including at least an inner wall; a gas flow system operated by a processor 76 and coupled to said plasma processing chamber, said gas flow system using controllers (e.g. 52, 56, 60, 62) to control the flow

of input gas into at least two different regions of said plasma processing chamber and comprising a gas inlet for receiving input gas to be delivered into the plasma processing chamber and at least first and second gas outlets 50, 54; wherein said at least two different regions include a lower peripheral region and a top region of the chamber and the peripheral region is not part of the top region (see Fig. 2 and its description).

Li et al. does not expressly disclose a gas inlet receiving a single input gas comprising a mixture of etching gases and delivering the single input gas to the at least two different regions, wherein at least a first portion of the input gas being delivered to the plasma processing chamber via the first outlet and a remaining portion of the input gas being delivered to the plasma processing chamber via the second outlet. Fujii et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figures 3 and 6, and their descriptions). Fujiyama et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figs. 1 and 3, and their descriptions). Yamazaki et al. discloses an apparatus comprising a gas inlet receiving a

single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figure 1 and its description). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Li et al. as to comprise the claimed gas inlet structure, because in such a way the same mixture of gases can be introduced to the chamber through the different regions. Furthermore, concerning the input gas being a mixture of gases or source gas suitable for use to etch said substrate in said plasma processing chamber, since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. Furthermore, the particular use for the source gas is viewed as an intended use that does not further limit, and therefore does not patentably distinguish the claimed invention. The apparatus of Li et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. is capable of using a source gas that is suitable for etching the substrate in the plasma processing chamber.

Additionally, note that the flow system of the apparatus of Li et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. can independently control the amount, volume or flow rate of the input gas into the at least two different regions of the plasma processing chamber. Furthermore, in the apparatus of Li et al., at least one of the outputs is configured to release the gas into an inner region of the plasma process

chamber, and at least a second output is configured to release the gas into an outer region of the process chamber. Additionally, the output gas of the apparatus of Li et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al., is mixed inside the gas flow controller. For example, in Fujii et al., gas line 20 is considered part of the gas flow controller; in Fujiyama et al. the gas line supplying the gases is also considered part of the gas flow controller; and in Yamazaki et al. note that there are three gas lines that are mixed inside the gas flow controller.

With respect to the gas flow system being configured to vary the amounts of first and remaining portions in order to control the distribution of neutral gas components inside the plasma processing chamber, note that the apparatus of Li et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. is capable of being configured in such a manner. Furthermore, concerning the substrate being a semiconductor substrate, note that this limitation is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses that do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Li et al. modified by Fujii et al., Fujiyama et al., or Yamazaki et al. is capable of etching a semiconductor substrate.

Additionally, concerning claim 10, note that Li et al. discloses the use of gas rings in an upper peripheral region (gas ring 38).

Concerning claims 71 and 75, note that in the apparatus of Li et al. '830 modified by Fujii et al. or Yamazaki et al. or Fujiyama et al., inherently the input gas delivered to the upper region will spend more time inside the process chamber than the gas delivered to the lower region.

Claims 1-5, 7-10, 16-17, 50, 57, 59, 62, 67-68, 70-71, and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al., U.S. Patent 6,070,551 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810.

Li et al. shows substantially the invention as claimed including a plasma processing system, said plasma processing system comprising: a substantially cylindrical plasma processing chamber 6 used to process a substrate 42, said substantially cylindrical plasma processing chamber including a top region 76 located on the top surface of said substantially cylindrical plasma processing chamber, an upper peripheral region (the region around gas nozzle 34a), and a lower peripheral region (the region around gas nozzle 34) located on a surface surrounding the periphery of said substantially cylindrical plasma processing chamber including at least an inner wall; a gas flow system operated by a processor (see col. 4-lines 59-65) and coupled to said plasma processing chamber, said gas flow system using controllers (37a,37,60) to control the flow of input gas into at least two different regions of said plasma processing chamber and comprising a gas inlet for receiving input gas to be delivered into the plasma processing chamber and at least first and second gas outlets; wherein said at

least two different regions include a lower peripheral region and a top region of the chamber and the peripheral region is not part of the top region (see Fig. 3 and col. 4-line 33 to col. 5-line 63).

Li et al. does not expressly disclose the gas inlet receiving a single input gas comprising a mixture of etching gases and delivering the single input gas to the at least two different regions, wherein at least a first portion of the input gas being delivered to the plasma processing chamber via the first outlet and a remaining portion of the input gas being delivered to the plasma processing chamber via the second outlet. Fujii et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figures 3 and 6, and their descriptions). Fujiyama et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figs. 1 and 3, and their descriptions). Yamazaki et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered

to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figure 1 and its description). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Li et al. as to comprise the claimed gas inlet structure, because in such a way the same gas (or mixture of gases) can be introduced to the chamber through the different regions. Furthermore, concerning the input gas being a mixture of gases or source gas suitable for use to etch said substrate in said plasma processing chamber, since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. Furthermore, the particular use for the source gas is viewed as an intended use that does not further limit, and therefore does not patentably distinguish the claimed invention. The apparatus of Li et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. is capable of using a source gas that is suitable for etching the substrate in the plasma processing chamber.

With respect to the gas flow system being configured to vary the amounts of first and remaining portions in order to control the distribution of neutral gas components inside the plasma processing chamber, note that the apparatus of Li et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. is capable of being configured in such a manner. Furthermore, concerning the first and second portions of said input gas having the same mixture of etchant source gases as said input gas and the substrate being a semiconductor substrate, note that this limitation is directed to a method limitation

instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses that do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Li et al. modified by Fujii et al., Fujiyama et al., or Yamazaki et al. is capable of etching a semiconductor substrate and providing the gases as claimed.

Regarding claims 7-9, note that the flow system of the apparatus of Li et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. can independently control the amount, volume or flow rate of the input gas into the at least two different regions of the plasma processing chamber.

With respect to claim 10, note that Li et al. suggests the replacement of the gas injectors of Fig. 1 with gas rings in an upper peripheral region as broadly interpreted (see col. 8-lines 7-22).

Concerning claim 50, note that in the apparatus of Li et al., one of the outputs is configured to release the gas into a top central region of the plasma process chamber (outlet 56), and a second output is configured to release the gas into an upper peripheral region of the process chamber (outlets 38). Furthermore, regarding the processing chamber being azimuthally symmetric, the configuration of the claimed chamber is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.

With respect to claim 57, note that the apparatus of Li et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. includes a gas channel housing and a gas delivery ring positioned around the periphery of the process chamber and cooperating to supply the first portion of the input gas into the upper peripheral region, the gas channel housing including a gas channel operatively coupled to the first gas outlet and extending around the periphery of the gas channel housing, the gas delivery ring including a series of holes providing openings between the gas channel and the upper internal areas of the process chamber, the first gas outlet supplying said first portion of said input gas to the gas channel, the gas channel equally distributing the first portion of said input gas through each of the holes in the gas delivery ring, and the holes feeding the first portion of said input gas into the upper peripheral region of the process chamber.

Concerning the number of holes in the gas delivery ring, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum number of holes in the gas delivery ring depending upon a variety of factors including the desired gas coverage area and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Regarding claims 67-68, note that the input gas in Li et al. is not mixed after leaving the flow controller and is delivered directly to the outlets.

Concerning claims 71 and 75, note that in the apparatus of Li et al. '551 modified by Fujii et al. or Yamazaki et al. or Fujiyama et al., inherently the input gas delivered to

the upper region will spend more time inside the process chamber than the gas delivered to the lower region.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al., U.S. Patent 6,070,551 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810, as applied to claims 1-5, 7-10, 16-17, 50, 57, 59, 62, 67-68, 70-71, and 75 above, and further in view of Wing et al., U.S. Patent 6,277,235.

Li et al., Fujii et al., Fujiyama et al. and Yamazaki et al. are applied as above but do not expressly disclose where the process gas that is flowed through the lower region of the chamber is flown through a chuck supporting a wafer. Wing et al. discloses flowing input gas through a chuck supporting a wafer (see fig. 1 and col. 3-line 19 to col. 4-line 22). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Li et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. so as to flow input gas through the chuck as disclosed by Wing et al. because Wing et al. shows this as a suitable method to flow gas into a processing chamber.

Claims 58, 60-61, and 63-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al., U.S. Patent 6,070,551 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent

4,105,810 as applied to claims 1-5, 7-10, 16-17, 50, 57, 59, 62, 67-68, 70-71, and 75 above, and further in view of Li et al., U.S. Patent 6,009,830.

Li et al. '551, Fujii et al., Fujiyama et al., and Yamazaki et al. are applied as above but do not expressly disclose a gas distribution plate at the top central portion of the chamber. Li et al. '830 discloses a gas distribution plate 38 at the top central portion of the processing chamber for the distribution of gases (see fig. 2 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Li et al. '551 modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. so as to have a gas distribution plate at the top central portion because in such a way the gas can be accurately directed to the surface of the wafer.

Regarding claims 60 and 63-64, note that the apparatus modified by Li et al. '551 modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. and further modified by Li et al. produces the claimed invention.

Concerning claim 61, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a seal between the gas delivery ring and the vacuum plate and the walls and the delivery ring in order to provide for an adequate vacuum within the processing chamber.

Claims 1-5, 7-9, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 50, 54, 66-68, 70-73, and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al.,

U.S. Patent 6,024,826 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810.

Collins et al. shows the invention as claimed including a plasma processing system comprising: a substantially cylindrical plasma processing chamber within which a plasma is both ignited and sustained for processing a substrate 156, said plasma processing chamber having no separate plasma generation chamber, said plasma processing chamber having an upper end and a lower end and including a top region located on the top surface of the chamber, an upper peripheral region, and a lower peripheral region located on a surface surrounding the periphery of said processing chamber; and a gas flow system (164a-d, 300) coupled to said plasma processing chamber, said gas flow system controlling the flow of input gas into at least two different regions of said plasma processing chamber and comprising a gas inlet for receiving input gas to be delivered into the plasma processing chamber and at least first and second gas outlets; wherein said at least two different regions including at least one peripheral region located at a top side surface of said plasma processing chamber (gas lines 164d), at least one top region located at a center top surface of said plasma processing chamber (gas line 164 a), said peripheral region being located closer to said upper end of said plasma processing chamber than said lower end of said plasma processing chamber; a lower peripheral region (gas line 164b), and a lower region near edges of the substrate (gas line 164c); and wherein the apparatus further comprises a coupling window disposed at an upper end of the plasma processing chamber, and an RF antenna arrangement disposed above a plane defined by the sbstrate when the

substrate is disposed within the plasma processing chamber. For a complete description of the apparatus see, for example, figs. 8a-b, 9, and 13-21 and their descriptions.

Collins et al. further discloses that a process gas is furnished into the chamber through any one or all of the variety of gas lines (164a-d) but does not expressly disclose a gas inlet receiving a single input gas comprising a mixture of etching gases and delivering the single input gas to the at least two different regions, wherein at least a first portion of the input gas being delivered to the plasma processing chamber via the first outlet and a remaining portion of the input gas being delivered to the plasma processing chamber via the second outlet. Fujii et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figures 3 and 6, and their descriptions). Fujiyama et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figs. 1 and 3, and their descriptions). Yamazaki et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture

of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figure 1 and its description). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Collins et al. as to comprise the claimed gas inlet structure, because in such a way the same mixture of gases can be introduced to the chamber through the different regions. Furthermore, concerning the input gas being a mixture of gases or source gas suitable for use to etch said substrate in said plasma processing chamber, since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. Furthermore, the particular use for the source gas is viewed as an intended use that does not further limit, and therefore does not patentably distinguish the claimed invention. The apparatus of Collins et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. is capable of using a source gas that is suitable for etching the substrate in the plasma processing chamber.

With respect to the gas flow system being configured to vary the amounts of first and remaining portions in order to control the distribution of neutral gas components inside the plasma processing chamber, note that the apparatus of Collins et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. is capable of being configured in such a manner. Furthermore, concerning the first and second portions of said input gas

having the same mixture of etchant source gases as said input gas and the substrate being a semiconductor substrate, note that this limitation is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses that do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Collins et al. modified by Fujii et al., Fujiyama et al., or Yamazaki et al. is capable of etching a semiconductor substrate and providing the gases as claimed.

Additionally, note that the flow system of the apparatus of Collins et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. can independently control the amount, volume or flow rate of the input gas into the at least two different regions of the plasma processing chamber. Furthermore, in the apparatus of Collins et al., at least one of the outputs is configured to release the gas into an inner region of the plasma process chamber, and at least a second output is configured to release the gas into an outer region of the process chamber. Additionally, the output gas of the apparatus of Collins et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al., is mixed inside the gas flow controller. For example, in Fujii et al., gas line 20 is considered part of the gas flow controller; in Fujiyama et al. the gas line supplying the gases is also considered part of the gas flow controller; and in Yamazaki et al. note that there are three gas lines that are mixed inside the gas flow controller.

Regarding the shape of the processing chamber being azimuthally symmetric, the configuration of the claimed chamber is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.

Regarding claims 67-68, note that the input gas in Collins et al. is not mixed after leaving the flow controller and is delivered directly to the outlets.

Concerning claims 71 and 75, note that in the apparatus of Collins et al. modified by Fujii et al. or Yamazaki et al. or Fujiyama et al., inherently the input gas delivered to the upper region will spend more time inside the process chamber than the gas delivered to the lower region.

Claims 6 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al., U.S. Patent 6,024,826 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810, as applied to claims 1-5, 7-9, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 50, 54, 66-68, 70-73, and 75 above, and further in view of Wing et al., U.S. Patent 6,277,235.

Collins et al., Fujii et al., Fujiyama et al. and Yamazaki et al. are applied as above but do not expressly disclose that the substrate holder comprises a chuck for supporting the wafer and wherein the process gas that is flowed through the lower region of the chamber is flown through the chuck. Wing et al. discloses the use of a chuck for supporting the wafer wherein an input gas is release through the chuck (see fig. 1 and col. 3-line 19 to col. 4-line 22). In view of this disclosure, it would have been obvious to

one of ordinary skill in the art at the time the invention was made to modify the apparatus of Collins et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. so as to further comprise a chuck for holding the wafer and to flow input gas through the chuck as disclosed by Wing et al. because Wing et al. shows this as a suitable structure to hold the wafer and flowing gas into a processing chamber.

Claims 10 and 57-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al., U.S. Patent 6,024,826 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810, as applied to claims 1-5, 7-9, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 50, 54, 66-68, 70-73, and 75 above, and further in view of Li et al., U.S. Patent 6,070,551.

Collins et al., Fujii et al., Fujiyama et al. and Yamazaki et al. are applied as above but do not expressly disclose the use of gas rings and a gas distribution plate at the top central portion of the chamber. Li et al. '830 discloses a gas distribution plate 38 at the top central portion of the processing chamber for the distribution of gases and that gas nozzles can be replaced by rings or ring-like structures since they are suitable gas introduction means (see fig. 2 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Li et al. '551 modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. so as to have a gas distribution plate at the top central portion and gas rings because in such a way the gas can be accurately directed to the chamber and the surface of the wafer.

With respect to claim 57, note that the apparatus of Collins et al. et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. includes a gas channel housing and a gas delivery ring positioned around the periphery of the process chamber and cooperating to supply the first portion of the input gas into the upper peripheral region, the gas channel housing including a gas channel operatively coupled to the first gas outlet and extending around the periphery of the gas channel housing, the gas delivery ring including a series of holes providing openings between the gas channel and the upper internal areas of the process chamber, the first gas outlet supplying said first portion of said input gas to the gas channel, the gas channel equally distributing the first portion of said input gas through each of the holes in the gas delivery ring, and the holes feeding the first portion of said input gas into the upper peripheral region of the process chamber.

Concerning the number of holes in the gas delivery ring, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum number of holes in the gas delivery ring depending upon a variety of factors including the desired gas coverage area and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Regarding claims 60 and 63-64, note that the apparatus modified by Collins et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. and further modified by Li et al. produces the claimed invention.

Concerning claim 61, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a seal between the gas delivery ring and the vacuum plate and the walls and the delivery ring in order to provide for an adequate vacuum within the processing chamber.

Claims 45 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al., U.S. Patent 6,024,826 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810, as applied to claims 1-5, 7-9, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 50, 54, 66-68, 70-73, and 75 above, and further in view of Ueda et al., U.S. Patent 5,810,932 and Kadomura, U.S. Patent 6,096,160.

Collins et al., Fujii et al., Fujiyama et al. and Yamazaki et al. are applied as above but fail to expressly disclose the electromagnet and dc supply arrangement as claimed. Ueda et al. discloses a chamber 15; a coupling window 11 disposed at an upper end of the chamber; an RF antenna 12 disposed above a plane defined by the substrate; and an electromagnet arrangement 14 proximate the antenna (see Figure 7 and its description). Additionally, Kadomura discloses a magnet arrangement 53 whereby a d.c. power supply 68 is coupled to the magnets and is varied in a controlled manner (see abstract) in order to better control the plasma. In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Collins et al. modified by Fujii et al., Fujiyama et al. or Yamazaki et al., so as to include the controller and electromagnet arrangement of

Kadomura and Ueda et al. because such a control system allows for better controllability of the plasma system.

Claims 1-5, 7-10, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 54, 57, 59, 62, 66, 70-72, and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al., U.S. Patent 6,228,781 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810.

Murugesh et al. shows the invention substantially as claimed including a plasma processing system 10 comprising: a plasma processing chamber within which a plasma is both ignited and sustained for processing a substrate 17, said plasma processing chamber having no separate plasma generation chamber, and having an upper end and a lower end, the processing chamber including a top region 46 located on the top surface of said plasma processing chamber and an upper peripheral region (the region around gas nozzles 38,40) located on a surface surrounding the periphery of said plasma processing chamber; a gas flow system coupled to said plasma processing chamber (for example, 35A, 35A', 35B, 35B'), said gas flow system controlling flow of input gas into at least two different regions of said plasma processing chamber, wherein said at least two different regions include at least a top central region, an upper peripheral region, and a lower peripheral region of the chamber; wherein said upper peripheral region is closer to the upper end of the plasma processing chamber than the lower portion of the plasma processing chamber; a coupling window disposed at an upper end of the plasma processing chamber; and an RF antenna arrangement

disposed within the plasma processing chamber, (see figs. 1A-1D and col. 4-line 43 to col. 8-line 10).

Murugesh et al. does not expressly disclose a cylindrical processing chamber. However, regarding the shape of the chamber, such configuration is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coil is significant, see In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Murugesh et al. does not expressly disclose a gas inlet receiving a single input gas comprising a mixture of etching gases and delivering the single input gas to the at least two different regions, wherein at least a first portion of the input gas being delivered to the plasma processing chamber via the first outlet and a remaining portion of the input gas being delivered to the plasma processing chamber via the second outlet. Fujii et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figures 3 and 6, and their descriptions). Fujiyama et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma

processing chamber via a second outlet (see, for example, figs. 1 and 3, and their descriptions). Yamazaki et al. discloses an apparatus comprising a gas inlet receiving a single input gas which comprises a mixture of gases and delivering the single input gas to at least two different regions; wherein a first portion of the input gas can be delivered to the plasma processing chamber via a first outlet and the remaining portion of the input gas can be delivered to the plasma processing chamber via a second outlet (see, for example, figure 1 and its description). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Murugesh et al. as to comprise the claimed gas inlet structure, because in such a way the same mixture of gases can be introduced to the chamber through the different regions. Furthermore, concerning the input gas being a mixture of gases or source gas suitable for use to etch said substrate in said plasma processing chamber, since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. Furthermore, the particular use for the source gas is viewed as an intended use that does not further limit, and therefore does not patentably distinguish the claimed invention. The apparatus of Murugesh et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. is capable of using a source gas that is suitable for etching the substrate in the plasma processing chamber.

With respect to the gas flow system being configured to vary the amounts of first and remaining portions in order to control the distribution of neutral gas components inside the plasma processing chamber, note that the apparatus of Murugesh et al.

modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. is capable of being configured in such a manner. Furthermore, concerning the first and second portions of said input gas having the same mixture of etchant source gases as said input gas and the substrate being a semiconductor substrate, note that this limitation is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses that do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Murugesh et al. modified by Fujii et al., Fujiyama et al., or Yamazaki et al. is capable of etching a semiconductor substrate and providing the gases as claimed.

Additionally, note that the flow system of the apparatus of Murugesh et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al. can independently control the amount, volume or flow rate of the input gas into the at least two different regions of the plasma processing chamber. Furthermore, in the apparatus of Murugesh et al., at least one of the outputs is configured to release the gas into an inner region of the plasma process chamber, and at least a second output is configured to release the gas into an outer region of the process chamber. Additionally, the output gas of the apparatus of Murugesh et al. modified by Fujii et al, Fujiyama et al. or Yamazaki et al., is mixed inside the gas flow controller. For example, in Fujii et al., gas line 20 is considered part of the gas flow controller; in Fujiyama et al. the gas line supplying the gases is also

considered part of the gas flow controller; and in Yamazaki et al. note that there are three gas lines that are mixed inside the gas flow controller.

Regarding the shape of the processing chamber being azimuthally symmetric, the configuration of the claimed chamber is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.

Additionally, concerning claim 10, note that Murugesh et al. discloses the use of gas rings (gas ring 37).

With respect to claim 57, note that the apparatus of Murugesh et al. modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. includes a gas channel housing and a gas delivery ring positioned around the periphery of the process chamber and cooperating to supply the first portion of the input gas into the upper peripheral region, the gas channel housing including a gas channel operatively coupled to the first gas outlet and extending around the periphery of the gas channel housing, the gas delivery ring including a series of holes providing openings between the gas channel and the upper internal areas of the process chamber, the first gas outlet supplying said first portion of said input gas to the gas channel, the gas channel equally distributing the first portion of said input gas through each of the holes in the gas delivery ring, and the holes feeding the first portion of said input gas into the upper peripheral region of the process chamber.

Concerning the number of holes in the gas delivery ring, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

determine through routine experimentation the optimum number of holes in the gas delivery ring depending upon a variety of factors including the desired gas coverage area and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Regarding claims 67-68, note that the input gas in Murugesh et al. is not mixed after leaving the flow controller and is delivered directly to the outlets.

Concerning claims 71 and 75, note that in the apparatus of Murugesh et al. modified by Fujii et al. or Yamazaki et al. or Fujiyama et al., inherently the input gas delivered to the upper region will spend more time inside the process chamber than the gas delivered to the lower region.

Claims 6 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al., U.S. Patent 6,228,781, in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810, as applied to claims 1-5, 7-10, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 54, 57, 59, 62, 66, 70-72, and 75 above, and further in view of Wing et al., U.S. Patent 6,277,235.

Murugesh et al., Fujii et al., Fujiyama et al. and Yamazaki et al. are applied as above but do not expressly disclose where the process gas that is flowed through the lower region of the chamber is flown through a chuck supporting a wafer. Wing et al. discloses flowing input gas through a chuck supporting a wafer (see fig. 1 and col. 3-line 19 to col. 4-line 22). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of

Murugesh et al. modified by Fujii et al., Fujiyama et al. or Yamazaki et al., so as to flow input gas through the chuck as disclosed by Wing et al. because Wing et al. shows this as a suitable method to flow gas into a processing chamber.

Claims 45 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al., U.S. Patent 6,228,781, in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810, as applied to claims 1-5, 7-10, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 54, 57, 59, 62, 66, 70-72, and 75 above, and further in view of Ueda et al., U.S. Patent 5,810,932 and Kadomura, U.S. Patent 6,096,160.

Murugesh et al., Fujii et al., Fujiyama et al., and Yamazaki et al. are applied as above but fails to expressly disclose the electromagnet and dc supply arrangement as claimed. Ueda et al. discloses a chamber 15; a coupling window 11 disposed at an upper end of the chamber; an RF antenna 12 disposed above a plane defined by the substrate; and an electromagnet arrangement 14 proximate the antenna (see Figure 7 and its description). Additionally, Kadomura discloses a magnet arrangement 53 whereby a d.c. power supply 68 is coupled to the magnets and is varied in a controlled manner (see abstract) in order to better control the plasma. In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Murugesh et al. modified by Fujii et al., Fujiyama et al. or Yamazaki et al., so as to include the controller and electromagnet arrangement of

Kadomura and Ueda et al. because such a control system allows for better controllability of the plasma system.

Claims 58 and 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murugesh et al., U.S. Patent 6,228,781 in view of Fujii et al., U.S. Patent 4,980,204, or Fujiyama et al., U.S. Patent 4,529,474, or Yamazaki et al., U.S. Patent 4,105,810 as applied to claims 1-5, 7-10, 16-17, 19, 23-25, 28-33, 35, 42-44, 48, 54, 57, 59, 62, 66, 70-72, and 75 above, and further in view of Li et al., U.S. Patent 6,009,830.

Murugesh et al. '781, Fujii et al., Fujiyama et al., and Yamazaki et al. are applied as above but do not expressly disclose a gas distribution plate at the top central portion of the chamber. Li et al. '830 discloses a gas distribution plate 38 at the top central portion of the processing chamber for the distribution of gases (see fig. 2 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Li et al. '551 modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. so as to have a gas distribution plate at the top central portion because in such a way the gas can be accurately directed to the surface of the wafer.

Regarding claim 60, note that the apparatus modified by Murugesh et al. '781 modified by Fujii et al. or Fujiyama et al. or Yamazaki et al. and further modified by Li et al. produces the claimed invention.

Concerning claim 61, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a seal between the gas delivery ring and

the vacuum plate and the walls and the delivery ring in order to provide for an adequate vacuum within the processing chamber.

Response to Arguments

Applicant's arguments filed 12/20/05 have been fully considered but they are not persuasive.

With respect to the rejection under 35 USC 112, first paragraph, note that this rejection has still been maintained with respect to claim 63 because the phrase raising the issue of new matter has not been deleted from the claim.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Concerning the fact that some of the references show deposition processes while many of the claims require etching, note that this limitation is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses that do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatuses described in the above rejections are capable of etching a semiconductor substrate and providing the gases as claimed.

With respect to the fact that the Collins et al. and Murugesh et al. references do not disclose inputting the same gas to different regions of the chamber, note that this limitation is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses that do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatuses described in the above rejections are capable of inputting gases that are substantially the same to different regions of the chamber.

Furthermore, concerning applicant's contention that many of the dependent claims are not properly rejected in the above rejections, the examiner respectfully submits that the rejections as stated above properly reject the claims as stated in the headings of the respective rejections.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Luz L. Alejandro
Primary Examiner
Art Unit 1763

March 6, 2006